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The Determinants of Exports in the Greek Manufacturing Sector

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Abstract: The paper uses price and non price measures of competitiveness to investigate the determinants of Greek manufacturing export over the period 1988-2005. The conceptual framework bases on the estimation of an export demand function augmented with supply side factors. The findings of the paper indicate that the price elasticity of Greek exports remains higher than the elasticity of any other determinant. This indicates that the main driver of Greek exports has been the ability to reduce prices. Although, exports have a smaller elasticity in product differentiation, technological stock impacts positively on exports of all industrial groups. The results also indicate that in industries with greater ability to differentiate products, the price elasticity of exports becomes smaller. As Greece has experienced substantially losses in competitiveness of traditional low-technology sectors, the above result imply that a successful export paradigm in the future should pay attention to non-price competitiveness. The empirical analysis also suggest that exporting has been a residual activity for Greek manufacturers as increases in production capacity due to demand fluctuations led to exports decreases.

JEL Classification: F12, L6, L12, D24

Keywords: Greece, Manufacturing Sector, Exports, Price Competitiveness, Non-Price Competitiveness, Domestic Market Hypothesis

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1. Introduction

The semantic changes occurred in Euroland within the last fifteen years, with most prominent the abolishment of tariff restrictions and the adoption of a common currency have created an attractive environment for the development of substantial export activity. However, these radical changes have not been proved very beneficial for peripheral European countries like Greece whose trade imbalances prevail for long periods indicating serious problems in the country's competitiveness.

The European peripheral countries (including Greece) encounter severe debt crisis that is originated to the accumulation of substantial trade deficits whose funding was not any more feasible with external borrowing especially after the financial crisis of 2008. A key strategy for countries with continuous budget deficits is to improve trade balances via export orientation policies. The crucial question raised for policy makers is what are export drivers and their impact over short-run and long run. A core part of this question can be focused on the responsiveness of exports to relative price changes. Nevertheless, recent empirical trade studies (see Madsen (2008), Leon-Ledesma (2005), Athanasoglou and Bardaka (2010), Bournakis (2012)) have shown that exports in OECD countries are also sensitive to non-price factors. The latter reflects the ability of domestic producers to differentiate their product shifting the competitive edge from cost to product quality. This consideration is not entirely new as its theoretical foundation can be already found in the propositions of the so-called "new trade theory" (Posner (1961), Krugman (1989, 1991), Grossman and Helpman (1991)) whose focus is on the degree of technological sophistication as a source of comparative advantage rather than product price.

The increasing involvement of China and other South East Asian countries in global export markets requires from European countries to identify an alternative export paradigm for restoring international competitiveness. While price competitiveness always remains an important aspect of export success, European economies must focus on how to improve the technological content of their products. This is already recognised in Lisbon agenda (2006) specifying that Europe's future is in the development of a knowledge-driven economy where trade comparative advantage is enhanced with investment in research and human capital. For a small economy like Greece whose trading partners are countries of similar level of development and thus trade takes place under conditions of monopolistic competition, the key strategy is to design policies that promote innovation and product differentiation. The present paper endeavours to investigate the determinants of Greek exports including factors of both price and non-price competitiveness. Additionally, the paper sheds light to factors associated with the structure of the domestic economy. In a small economy where productive capacity is limited, exports are subject to domestic market pressure (DMP). The DMP hypothesis suggests that when total demand (domestic plus exports) exceeds maximum output then domestic industries are biased towards domestic sales considering exporting as a residual activity (Eaton *et al*. (1966) and Winters (1974)). In practice, serving solely the domestic market is likely to be more attractive due to a number of imperfections involved in exporting (Riedel *et al*. 1984).[1] Another domestic condition that might impact on exports is the degree of monopolistic power in the internal market. Monopolistic power is correlated with economies of scale and high profitability, factors that are likely to play crucial role on exports.

Whereas there are a number of studies that examine empirically the effect of price and non-price competitiveness on exports for developed economies, hardly any work of that kind has been done for Greece. The existing literature on Greece's export performance suffers from two main drawbacks that we seek to diminish with the present study. First, econometric analysis is conducted on a series of aggregate data (Balassa et al. (1989)) failing to capture any industry heterogeneity in export behaviour and second, the empirical export function fails to account appropriately for non-price competitiveness (Arghyroy and Bazina (2003)). Some recent studies that use panel data techniques (Athanasoglou and Bardaka (2010) and Athanasoglou et al. (2010)) apply a very crude measure of technological sophistication that imperfectly captures the effect of product differentiation on trade[2]. The current study overcomes these shortcomings using evidence from 18 manufacturing industries over the period 1988-2005. The remaining of the paper is organised as follows: Section 2 specifies the analytical export function, section 3 discusses data measurement issues, section 4 presents the econometric model and the results and section 5 concludes.

[1] The existence of high transportation and sunk costs that derive from the establishment of sales network in international markets can be potentially serious impediments of exports.

[2] They use a measure of fixed capital stock assuming that new technological developments are embodied in purchases of new fixed assets. Although this might be true according to the propositions of the endogenous growth theory, this measure fails to record the investment done in intangible assets that are the most important components of technological capital.

2. Model Specification

We build our theoretical specification upon an export demand model. The traditional components of such an export model are relative prices and foreign income:

$$X_{i,t} = f(p_{i,t}, Y_t^c) \tag{1.1}$$

where X measures the level of exports in industry i at year t, p denotes relative prices in industry i at year t and Y denotes foreign income of Greece's main export partners c at year t.[3] The price index p highlights the effect of price and cost structure on exports compared to Greece's trading partners. As already mentioned cost competitiveness is not the only factor of exports as the degree of technological sophistication might also impact on export behaviour. Kaldor's (1978) paradox verifies this proposition showing that exports growth moves proportionally with unit labour costs. The main implication of this finding was that cost performance of exporters is equally important with the quality of good exported. Models that propose non-price factors as a source of comparative advantage argue that trade is driven by domestic innovative activity and this proposition has gained empirical support by Soete (1987), Dosi (1988), Amendola et al. (1992) and Verspagen (1992). The two measures available to capture the level of technological stock are patents and Research and Development (R&D). Patents represent only the outcome of the innovative activity without reflecting the accumulated knowledge generated from research effort. For that reason, R&D stock is more appropriate to measure technological sophistication.

A serious drawback of the export demand function (1.1) is that it implicitly assumes an infinite elasticity of export supply (Magee 1975), which is a very strong assumption for small economies like Greece. The elasticity of export supply in the short run is likely to be driven by various factors and definitely there are export supply restrictions in the long run. There is a need to investigate further the DMP hypothesis augmenting the export demand function with measures that capture supply side conditions especially those related to the capacity of the domestic economy. Apart from the DMP hypothesis, the domestic market structure might impact substantially on domestic producers' propensity to export. For example, firms in perfectly competitive markets seek exporting as a means for market expansion and thus there should be a positive relationship between exports and high domestic competition (Riedel *et al.* (1984)). On the other hand, implications of monopolistic power, such as economies of scale

[3] In the original formulation of the export function, foreign income is an industry invariant but in section 3, we explain how it becomes an industry specific variable after an appropriate adjustment.

(Nickell (1996)) and high profitability, can be proved very beneficial for exporting. The relation of exports with domestic market structure is not *a priori* given and the nature of this relationship is subject to empirical examination. We measure domestic market structure with a mark-up index that indicates whether or not industries diverge from the price-marginal cost rule.

After these amendments, the traditional export demand function shown in (1.1) is written as:

$$X_{i,t} = f(\underset{(-)}{p_{i,t}}, \underset{(+)}{Y^c_{i,t}}, \underset{(+)}{TC_{i,t}}, \underset{(-)}{DMP_{i,t}}, \underset{(-/+)}{\mu_{i,t}}) \tag{1.2}$$

where (TC) denotes technological capital in industry i at year t, measured by R&D stock and m is the mark-up index. The signs underneath indicate the expected signs of partial derivates of exports with respect to the individual determinant. The log-linear representation of (1.2) is:

$$\log X_{i,t} = a_0 + a_1 \log p_{i,t} + a_2 \log Y^c_{i,t} + a_3 \log TC_{i,t} + a_4 \log \mu_{i,t} + a_5 DMP_{i,t} + u_{i,t} \tag{1.3}$$

Since values of variables are in logs, all parameters can be now interpreted as export elasticities with respect to each determinant. Specification (1.3) includes price and non-price competitiveness but it does not investigate whether industries with high level of technological capital have smaller export price elasticities. To examine this hypothesis we set the following specification:

$$\log X_{i,t} = \gamma_0 + \log p_{i,t}(\gamma_1 + \gamma_3 \log TC_{i,t}) + \gamma_2 \log Y^c_{i,t} + \gamma_4 \log \mu_{i,t} + \gamma_5 DMP + u_{i,t} \tag{1.4}$$

Parameter γ_3 refers to the elasticity of an interacted term between prices and technological capital. Finally, specifications (1.3) and (1.4) are augmented with industry dummies to control for any unobserved -time invariant- industry heterogeneity. We have also included a set of year dummies to capture macroeconomic shocks that are common to all industries.

3. Background and Data Measurement

3.1 Background

The current data set covers 18 (2-digit ISIC) industries[4] from the whole spectrum of manufacturing activities over the period 1988-2005. The data obtained from OECD-STAN and EUKLEMS data bases.[5] This section provides a general discussion about characteristics of Greece's export activity. Figure 1 plots export intensity versus time for the total sector of manufacturing. Despite some fluctuations, the graph indicates an upward trend in export orientation for the period 1988-2005. In the beginning of the sample, Greek manufacturers export about 13% of their output while at the end of the period this share has increased to 26%.

Figure 1: Export Intensity of Greek Manufacturing

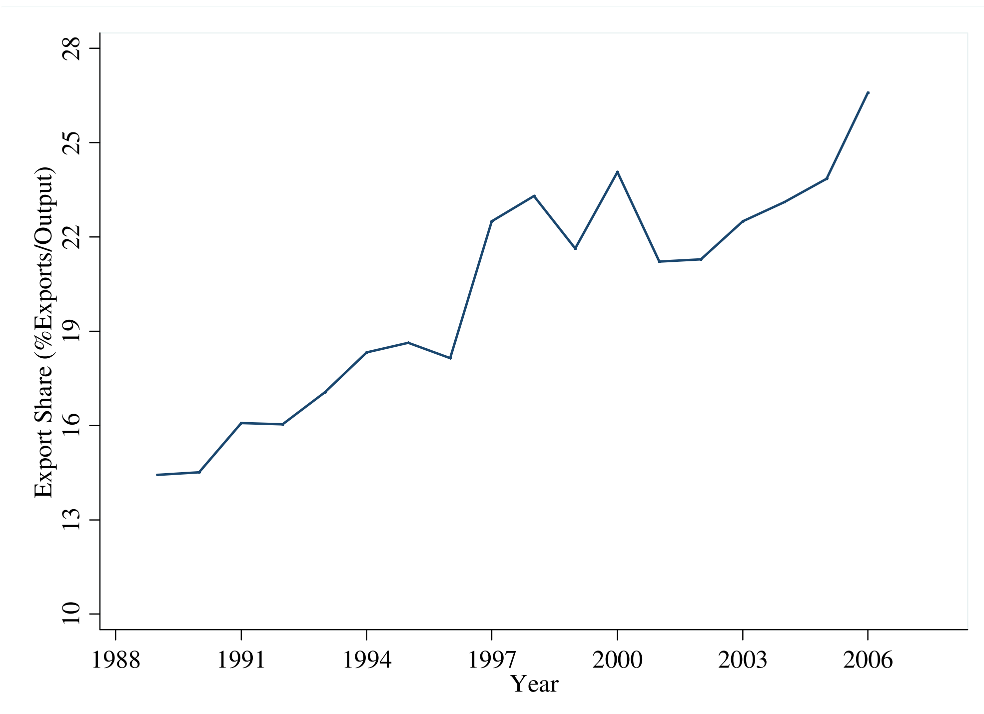

Figure 2 illustrates average export share by industry over the same period. Industries with large export orientation are textiles and apparel that ship to international markets 35% and 36%, of their output, respectively. Other industries with high export orientation are basic metals (code 27), coke (code 23), chemicals (code 24) and motor vehicles (code 34).

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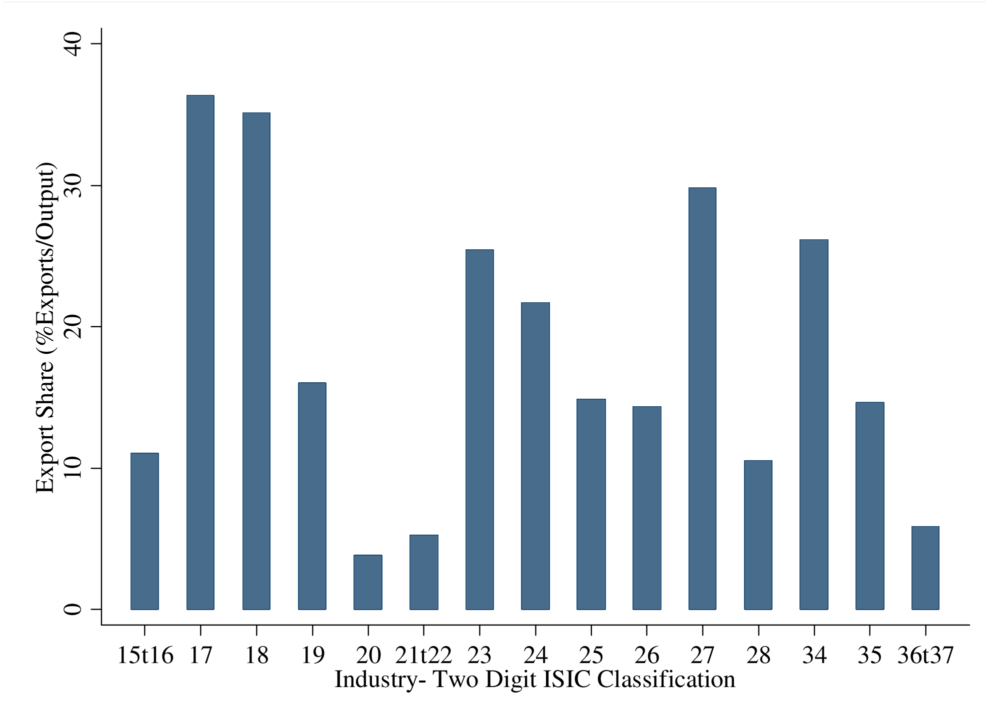
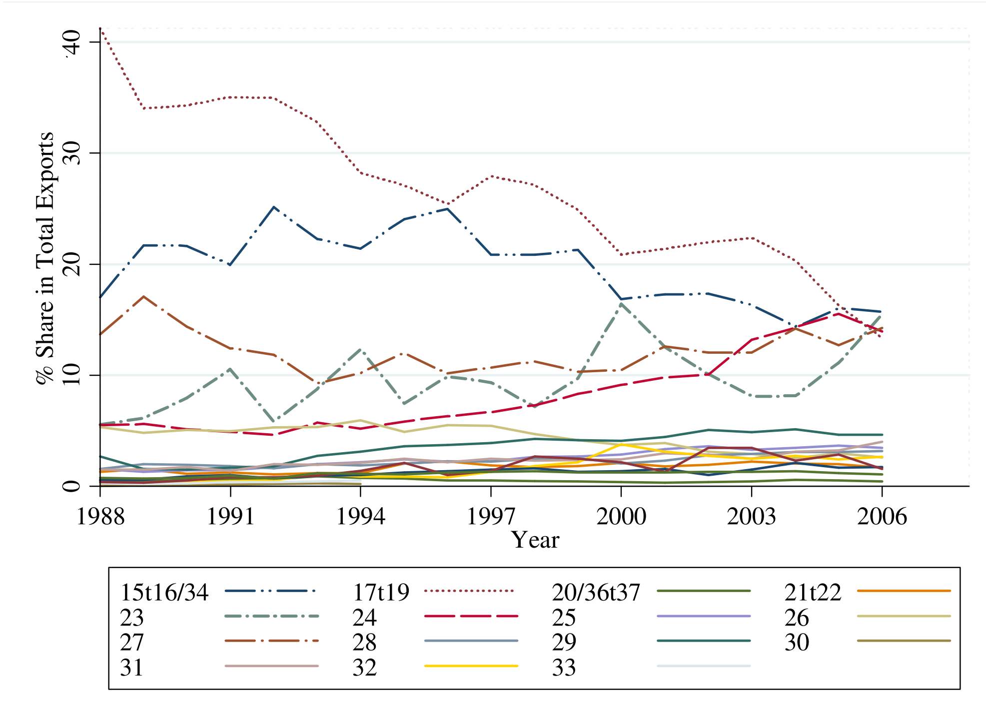
[4] The full list of industries used in the analysis is shown in Appendix 1.
[5] See Bournakis (2009) for a discussion regarding the compatibility of OECD and EUKLEMS data.

Figure 2: Export Intensity by Industry, 1988-2005



Over the period under study, there is a substantial shift of manufacturing exports away from low-technology to medium technology industries. This compositional change in exports is clearly illustrated in Figure 3. Food and tobacco industry accounts for almost 21% of total manufacturing exports in 1988 while the share falls to 15% in 2005. A more striking fall is found in textiles whose share to total exports decline from 20% to 5% by the end of the period. A similar downward trend is also evident in the wearing and apparel industry. The loss of competitiveness in these industries has been replaced by better export performance in industries of coke, chemical and basic metals. Coke's industry contribution to total exports increases from 7% in 1988 to 15% in 2005 while chemical's industry contribution increases from 4% to 13%. The group of high-tech industries keep constantly a small share throughout the whole period.

Figure 3: Composition of Greek Exports over Time, 1988-2005



The compositional shift illustrated in Figure 3 indicates a severe loss of competitiveness in traditional low-technology industries. This loss might have been resulted from Greece's entry in EU and the associated elimination of import tariffs from Third Countries. In this new environment, Greece has no longer been able to compete successfully, as other neighbouring Balkans countries and (or) South East Asia countries have undertaken a clear leadership in low technology manufacturing activities. Although this structural change can cause temporarily trade imbalances, in the long run it can create opportunities for developing comparative advantage in industries where product quality and technological sophistication matter more. This is the case, for instance, with the chemical industry, an eminently high-technology industry whose share to total exports has been steadily increased in this period. The loss of competitiveness in sectors where Greece has possessed comparative advantage for many decades indicates that the export paradigm should rely on products that are placed higher up in the product quality ladder and thus facing more dynamic demand in global markets. An important catalyst for this transformation in export specialisation is investment in R&D and more generally in factors of non-price competitiveness. Therefore, a systematic assessment of technological stock elasticities of Greek exports is rather essential.

3.2 Data Measurement and Definitions

Relative prices (*p*): Relative prices are measured by an index of real effective exchange rate. This is the ratio of gross output price indices (1995=100) between Greece and Greece's thirty competitors times the nominal exchange rate. The list of competitors consists of the EU-27 plus Australia, Korea, and USA. The data for output prices are taken from EUKLEMS data base. The index of real effective exchange rate is defined as:

$$reer = \frac{p_{i,t}^{GR}}{p_{i,t}^{c}} \times e^{GR} \tag{1.5}$$

where p is Greece's price index in industry i, p^c is competitor's c price index in industry i and e is the nominal effective exchange rate.

Foreign Income (*Y*): Income responsiveness of Greek exports is measured by an adjusted index of foreign GDP per Capita. A common problem encountered with the measurement of foreign income is that aggregate measures of economic activity are industry invariant. We overcome this difficulty by constructing an industry-specific index of foreign demand (see Bernard and Jensen (2004)) as follows:

$$Y_{i,t} = \sum_{j=1}^{15} x_{j,i,t} GDPC_{j,t} \tag{1.6}$$

where j indicates the top fifteen destinations of Greek exports. Greek exports to these countries account for more than 60%. [6] The value of GDP per Capita of these major partners at time t is adjusted by the share of Greek exports, x, of industry i to country j at year t. Data on export flows to specific destinations are taken from OECD (STAN).

Technological Capital (*TC*): This variable captures the effect of innovative activity on exports and it is essentially a measure of R&D capital stock computed via a perpetual inventory method as follows:

$$TC_{i,t} = (1-\delta)TC_{i,t-1} + RD_{i,t-1} \tag{1.7}$$

For the calculation of technological capital stock, we assume a standard rate of depreciation δ equal to 10%. An issue with equation (1.7) is to consider a value of benchmark capital that

[6] Appendix 2 provides average export shares to these destinations over the period under study

will be used to initiate the series. By assuming a zero change of technological capital in steady state, the initial capital stock is approximately by the following formula:

$$TC_{i,t_0=1988} = \frac{R\&D_{i,t_0=1988}}{g_i + \delta}$$

where g is the average growth rate of R&D investment over the period under study.

Price Mark-Up (m): We measure the degree of market concentration with a price mark-up. The latter is a factor that shows whether there are large divergences from the perfect competitive outcome. We first consider Lerner index:

$$L = \frac{price - MC}{price}$$

where MC is marginal cost. The Lerner index ranges between zero and one, with values close to zero representing perfect competition and values close to one representing monopoly. Transposing the Lerner index, we obtain the following expression:

$$price = \mu MC \qquad (1.8)$$

Where μ is marginal cost and defined as: $\frac{1}{1-L}$. An empirical difficulty is that marginal cost is unobserved, thus Lerner index can only be measured approximately. We follow Scherer and Ross (1990) and Tsaliki and Tsoulfidis (1998) measuring price as revenue per unit of real output and marginal cost as labour compensation per worker.

Domestic Market Pressure (*DMP*): To measure whether exports are viewed as a residual activity we use a capacity index that is mainly driven by domestic demand fluctuations. The latter are approximated by the difference between actual output and trend output. For instance, expansionary fiscal policy can lead to domestic capacity fluctuations in order to satisfy the temporary increases in demand. Trend output is calculated by applying the Hodrick-Prescott filter to real output. [7]

[7] Appendix 3 displays summary statistics of the variables described in this section.

4. Econometric Estimation and Results

The general formulation of the econometric model is $X_{i,t} = \alpha Z_{i,t} + u_{i,t}$, where i and t index industry and time, respectively and vector Z includes the export determinants discussed previously (i.e. real effective exchange rate, foreign income, technological stock, mark-up and domestic market pressure). Since the analysis is based on time-series-cross-section (TSCS) data we can control for unobserved heterogeneity. Therefore, the initial econometric model is formulated as:

$$X_{i,t} = \alpha Z_{i,t} + \gamma_i + \eta_t + \omega_{i,t} \tag{1.9}$$

where γ is a fixed industry intercept, η is a fixed year effect and ω is a well-behaved error term with zero mean and constant variance.

If there is correlation between the individual industry effects (γ) and the explanatory variables Z (i.e. $E(\gamma_i Z_{i,t}) \neq 0$), then the OLS estimates yield biased results. To obtain consistent estimates we can express variables as deviations from their sectoral means. This is the within group effect (WE) estimator and is consistent as long as explanatory variables are exogenous with exports. Additionally, in a panel data series error terms might be subject to contemporaneous correlation across units (i.e. $Cor(\omega_{i,t}, \omega_{k,t}) = 0$, for industry $i \neq k$). Spatial correlation across industry units might be caused by an economy-wise shock that affects all industries in the same direction. We need to ensure that our estimation technique produces results that are robust for spatial error correlation.

In the case of simultaneity bias, OLS is inappropriate and within an export function context, prices and export quantities are subject to strong feedback effects. Similarly, one might think that causality effects also exist between exports, R&D and mark-ups. The existence of simultaneity bias between exports and the right–hand side regressors requires an Instrumental Variable (IV) estimator. Appropriate instruments must fulfil two criteria. First, they must be strongly associated with endogenous variables and second, they must be uncorrelated with the error term. External instruments that satisfy both criteria are difficult to find and thus higher order lags of the endogenous variables can be used. The validity of higher order lags as instruments depends on whether the model specified in (1.9) has a white noise error term. We use the Arellano and Bond (1991) test to check whether error terms (1.9) are subject to first and higher order serial correlation. This test is more general than other panel correlation tests (i.e. Wooldridge (2002)) and is appropriately designed for models with endogenous regressors.

We first present results from regressions that consider only factors of price competitiveness. Although this specification excludes factors that might prove important in explaining Greek exports is rather useful for comparison purposes with findings from earlier studies. Results are presented in Table 1.

Table1: Determinants of Exports- Price Competitiveness

	OLS (1)	**WE (2)**	**PCSE (3)**	**IV (4)**
p	-1.10***	-1.10***	-0.91***	-1.74**
	(4.51)	(6.16)	(4.41)	(3.05)
Y	0.27	0.27**	0.05	-0.00
	(1.55)	(2.12)	(0.62)	(0.02)
Industry Dummies	Yes	No	Yes	No
Year Dummies	Yes	Yes	Yes	Yes
N	322	322	322	270
R2	0.96	0.43	0.92	0.84
	Diagnostic Tests			
F(17, 253)	4.1			
	(0.00)			
F(18,253)	2085.48			
	(0.00)			

Notes:
*Significance at 1%; ** significance at 5%, *** significance at 1%. Numbers in parentheses below estimates indicate t-statistics and numbers under diagnostic tests are p-values. WE is the within fixed effects estimator, PCSE is the Prais-Winsten estimator with panel corrected standard errors for cross-sectional dependence in the error terms, IV is the instrumental variable estimator. All estimates are produced with standard errors robust for cluster heteroscedasticity. The endogenous variable in the IV estimation is *p* and as instrument is used the values of *p* in years (t-1), (t-2) and (t-3). F statistics refer to joint significance of year and industry dummies, respectively. More diagnostic tests are provided in Table 2, where the reader can find the preferred specifications of the paper.

Two main points can be made from Table 1. First, Greek exports are more price than income elastic. The price elasticity of export demand is greater than unity in all specifications and becomes even higher when prices are corrected for endogeneity bias. Interestingly, the estimates of Table 1 are very close to those obtained in Athanasoglou and Bardaka (2010) (i.e. their long-run estimates range between 0.93 and 1.16) as well as to those documented in the relatively older study of Balassa et al.(1989) where price elasticity of Total exports is found above unity. The low income elasticities in Table 1 are a common characteristic also obtained in the previous studies.

Table 2: Determinants of Export Function- Price and Non Price Competitiveness

	OLS (1)	**WE (2)**	**PCSE (3)**	**IV (4)**
p	-0.88**	-0.88***	-0.67***	-0.13
	(3.06)	(4.21)	(3.34)	(0.28)
Y	0.3*	0.3**	0.06	0.01
	(1.75)	(2.34)	(0.8)	(0.28)
TC	0.07**	0.07***	0.08***	0.27***
	(2.01)	(2.41)	(2.38)	(4.86)
μ	0.25	0.25	0.28**	0.50***
	(1.33)	(1.59)	(2.33)	(3.18)
DMP	-0.72***	-0.72***	-0.37***	-0.47***
	(4.75)	(4.75)	(2.48)	(2.74)
Industry Dummies	Yes	No	Yes	No
Year Dummies	Yes	Yes	Yes	Yes
N	322	322	322	270
R2	0.93	0.45	0.92	0.86
	Diagnostic Tests			
AB(1)	-0.40			
	(0.68)			
AB(2)	-1.84			
	(0.07)			
AB(3)	-0.91			
	(0.36)			
Breusch-Pagan (153)		1243.35		
		(0.00)		
Wu-Hausman: F(4,234)				10.624
				(0.00)
Sargan Test				0.215
				(0.89)

Notes:
*Significance at 1%; ** significance at 5%, *** significance at 1%. Numbers in parentheses below estimates indicate t-statistics and numbers under diagnostic tests are p-values. WE is the within fixed effects estimator, PCSE is the Prais-Winsten estimator with panel corrected standard errors for cross-sectional dependence in the error terms, IV is the instrumental variable estimator. All estimates are produced with standard errors robust for cluster heteroscedasticity. Endogenous variables are p, TC and μ and as instruments used their values in years (t-1), (t-2) and (t-3) (See text for further details). AB is the Arrelano-Bond test (see Arrelano and Bond (1991)) for serial autocorrelation in the disturbance term under the null hypothesis of no autocorrelation. The test has been specified for up to three lags. Breusch-Pagan is the Langrage Multiplier (LM) test with degrees of freedom (nog*(nog-1)/2), where nog is the number of panels. This test checks the spatial correlation in the error terms across industries; under the null hypothesis the residuals are uncorrelated. The Wu-Hausman is an F-test for endogeneity between exports and the right hand-side regressors. Sargan test follows the Chi-squared distribution with (n-k) degrees of freedom, where n is the number of instruments used and k is the number of endogenous regressors. The null hypothesis of Sargan test is that instruments are valid.

Table 2 presents the results from the extended model that includes both price and non-price factors of competitiveness. Each column presents results from different estimation methods of (1.9). The Breusch-Pagan (BP) test rejects the null hypothesis of no contemporaneous correlation in the residuals and thus column (3) shows results from the Prais-Winsten estimator that corrects for spatial correlation in the panel errors. The Wu-Hausman (WH) rejects the exogeneity condition of the regressors (i.e. as potentially endogenous regressors considered prices, mark-up and technological stock) with exports indicating that the use of an instrumental variable is required. Relative prices and foreign income have always the expected sign but the size of price elasticity is now smaller compared to the figures of Table 1. Estimates of foreign income remain weak and much smaller than those obtained in the literature for OECD countries. As this result prevails throughout all specifications in Tables 1 and 2 suggests that Greek manufacturers could not get benefits from global growth. A possible interpretation for such a result lies within two hypotheses. First, Greece's exports to various destinations are only a small proportion of total imports in these areas, so a change in foreign per capita income can hardly represent a strong quantitative effect on Greek exports. Second, Greek exports move conversely with increases in foreign income because they signify low technology products. Under this hypothesis as foreign income increases, foreign demand shifts more rapidly towards products with strong technological element and thus primary and low-technology commodities cannot benefit from global growth.

The main message concerning the estimate of mark-up is that strengthening monopolistic power in the domestic market is not an export disincentive. This result can be interpreted in two manners. First, international expansion is associated with economies of scale that more easily realized in industries with monopolistic power. Second, monopolistic industries operate in the long run at a non- break even point implementing high profitability that enable them to support the establishment of international networks as well as to pay sunk costs required for exports. Concerning *DMP* the evidence produced indicates that Greek manufacturers face exports as a residual activity. The coefficient of *DMP* is negative and statistically significant throughout all estimations of Table 2. Our negative and statistically significant estimate is contrary to results found in Moreno (1997) and Nowak (2004) where the measure of domestic market pressure is either positive and statistically significant or totally insignificant. Whenever there is a boom in domestic demand, producers seek to serve the domestic market first without exhibiting strong commitment for substantial exporting activity. The fact that exports are likely to involve additional costs and uncertainties makes producers to discriminate between domestic and foreign market coveting the higher profits margins by just serving only the domestic market.

Stock of technological capital is a positive exports determinant in all columns of Table 2. This indicates that the ability of domestic producers to differentiate their product is a crucial factor of export expansion. This finding is consistent with models of monopolistic competition and "new trade theory" whose focus is not on price competitiveness but on product differentiation. However, the coefficient of technological stock is smaller than the one of relative prices in all columns of Table 2. Such finding suggests that exports are still more responsive to prices rather than to the level of technological embodiment. We give further consideration to the relationship between price and non-price competitiveness and their associated effects on exports by exploring the hypothesis whether technological stock reduces price elasticity in sectors with larger potential of product differentiation. For this exercise, we use the functional form specified in (1.3), which basically includes an interacted variable between *reer* and *TC*. The coefficient of the multiplicative term has the expected sign and level of statistical significance in all specifications but its magnitude is smaller than own price elasticity. From estimates of Table 3, we can safely argue that in sectors with strategic export advantage in product differentiation the elasticity of export prices is smaller.

Table 3: Estimates from Specification (1.4)

	WE (1)	PCSE (2)	IV (3)
p	-1.23***	-1.05***	-2.45***
	(5.05)	(4.31)	(4.37)
Y	0.29**	0.05	0.05
	(2.29)	(0.64)	(0.34)
μ	0.27*	0.26**	0.38***
	(1.71)	(2.16)	(2.6)
DMP	-0.73***	-0.41***	-0.46***
	(4.86)	(2.53)	(2.71)
$p\times TC$	0.02**	0.02**	0.11***
	(2.37)	(2.17)	(6.57)
Industry Dummies	No	Yes	No
Year Dummies	Yes	Yes	Yes
N	322	322	268
R2	0.45	1	0.87
Diagnostic Tests			
Breusch-Pagan (153)		593.103 (0.00)	
Wu-Hausman: F(4, 202)			4.059 (0.01)

Notes:
*Significance at 1%; ** significance at 5%, *** significance at 1%. Numbers in parentheses below estimates indicate t-statistics and numbers below diagnostic tests are p-values All estimates produced with robust standard errors to cluster heteroscedasticity. For more details about diagnostic statistics see notes in Table 2.

So far, all Tables presented in the paper pool observations across industries and years restricting estimates of export determinants to be homogeneous across industries. In this section, we further explore the case that industries are likely to have heterogeneous production patterns and hence, export behaviour is driven by different motives. Greenhalgh et al. (1994) and Ioannidis and Schreyer (1997) point out that innovative activity is a crucial export determinant only for medium and high technology industries. To investigate whether the influence of prices and technological stock on exports vary according to the technological content of the industry, we use Pavitt taxonomy (see Appendix B) to divide our sample into four groups: (a) Supplier Dominated (SDOM),(b) Scale Intensive (SCAI), (c) Science Based(SCIB), and (d) Specialised Suppliers (SPEC). We then consider the first two as a spectrum of low technology activities and the last two as a spectrum of high technology activities. We replicate the WE and IV estimators in Table 4.

Table 4: Export Determinants in Low and High Technological Groups

	WE (1)		IV (2)	
	LT	**HT**	**LT**	**HT**
p	-1.06***	-0.80**	-1.27**	-0.35
	(5.13)	(2.1)	(2.07)	(0.29)
Y	-0.04	0.21	-0.01	-0.01
	(0.28)	(1.4)	(0.05)	(0.06)
μ	-0.46**	0.44**	0.79**	0.08
	(2.66)	(2.01)	(3.13)	(0.42)
DMP	0.65***	-0.56***	2.44***	-0.55***
	(5.41)	(2.44)	(10.44)	(2.42)
TC	0.08**	0.28***	0.32***	0.37***
	(3.01)	(5.83)	(4.54)	(6.00)
Industry Dummies	No	No	No	No
Year Dummies	Yes	Yes	Yes	Yes
R2	0.44	0.81	0.81	0.84
N	178	144	150	120
Diagnostic Tests				
Wu-Hausman: F(4,96)			1.81	16.31
			(0.18)	(0.00)
Sargan Test			0.79	3.21
			(0.67)	(0.20)

Notes:
*Significance at 1%; ** significance at 5%, *** significance at 1%. Numbers in parentheses below estimates indicate t-statistics and numbers below diagnostic test are p-values. For further discussion about the diagnostic tests and the type of instruments used in IV regressions see notes in Table 2.

Two points can be made for estimates of Table 4. First, prices and technological stock have a positive impact on both industry groups. Therefore, we can argue that price competitiveness remains a vital export driver even in high technology industries. Nonetheless, the export elasticity of technological stock is greater while export elasticity of prices is smaller in high-technology group than the low-technology one. Under conditions of severe competition, low technology industries enforce their export orientation since this is an appropriate path to increase market potential and thus to increase the likelihood of survival. On the contrary, the positive sign of mark-up coefficient remains in the high technology group suggesting that as industries develop substantial innovative activity the exercise of some monopolistic power in domestic market is inevitable, which in turn contributes to more exports.

5. Concluding Remarks

Analysing the export performance of the Greek manufacturing sector for a period of 18 years we provide evidence for the importance of both price and non-price competitiveness. The responsiveness of exports to price changes remains the most significant factor among those considered, however, we reveal that the price elasticity becomes smaller once industries increase their potential to provide differentiated products. Similarly, non-price competitiveness, as measured by technological stock, is more vital for high technology industries than for low-technology ones. This finding is consistent with the “new trade theory” that stresses the role of R&D and monopolistic competition in international trade.

In the pooled sample, where different production patterns are not taken into consideration the degree of monopolistic power in the market impacts positively on exports contradicting the notion that export oriented is fostered when domestic competition is more severe. Nonetheless, this is not a universal effect as it is proven that for low technology industries the inability of producers to exploit monopolistic power lead them to a greater level of export involvement. In the high technology industries, where innovative activity is a principal component of the production structure, monopolistic power ensures the necessary financial resources required for international expansion. The results also indicate that Greek manufacturers view exporting activity as a residual activity in the period under study. More precisely, the way we measure domestic market pressure indicates that when productive capacity increases this mainly reflects an expansion of domestic demand without any positive effect on export supply.

The income elasticity of Greek manufacturing exports is relatively low compared to other studies in the literature and not always statistically significant at conventional levels. Balassa et al (1989) determine income elasticity of manufactured exports close to 2.4 while in the present study is only 0.3 when it is significant at conventional levels. The present estimates of income elasticity are also smaller compared to other historical estimates found for industrialised countries (Goldstein and Khan (1978, 1983). This result indicates that Greek manufacturers could not benefit substantially from global economic growth for boosting exports. Athanasoglou and Bardaka (2010) also revealed weak income elasticity for Greek exports, which turns to be a significant exports factor only in the long run. This finding needs further investigation that can be implemented with a different analytical framework such as an equilibrium correction model that distinguishes between the short run dynamics and the long run elasticities of export determinants.

Two results of the current study present special interest from a policy making point of view. First, the non-price competitiveness is a crucial export driver for all types of manufacturing activities. Non-price competiveness introduces horizontal product differentiation that improves quality and characteristics of exports. The export policy agenda must focus on the promotion of R&D that will contribute successfully to the formation of comparative advantage in activities that represent dynamic markets worldwide. This will be essentially a new export paradigm that will place Greece's competitiveness exclusively in high-technology activities as traditionally cheap labour and low technology industries are mainly concentrated on newly industrialised countries and (or) transition economies in the region of Balkans. Second, the consolidation of public finances is rather important not only for reducing public debt but also to avoid disincentives for exporting activity since domestic producers maintain a strong preference to serve only home markets after increases in internal demand.

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Appendices

Appendix 1: Manufacturing Industries

ISIC Rev2	Description
15t16	Food , Beverages and Tobacco
17t19	Textiles, Textile , Leather and Footwear
20	Wood and of Wood and Cork
21t22	Pulp, Paper, Paper , Printing and Publishing
23	Coke, Refined Petroleum and Nuclear Fuel
24	Chemicals and Chemical
25	Rubber and Plastics
26	Other Non-Metallic Mineral
27	Basic metals
28	Fabricated Metal
29	Machinery, nec
30	Office, Accounting and Computing Machinery
31	Electrical Machinery and Apparatus, nec
32	Radio, Television and Communication Equipment
33	Medical, Precision and Optical Instruments
34	Motor Vehicles, Trailers and Semi-Trailers
35	Other Transport Equipment
36t37	Manufacturing nec; Recycling

Appendix 2: Greece's Major Export Partners, Average Values for 1988-2005

Partner country	Export Share
Belgium	1.51%
Bulgaria	4.68%
Cyprus	8.20%
Denmark	0.60%
France	4.82%
Germany	12.22%
Italy	8.16%
Netherlands	2.70%
Portugal	0.51%
Romania	3.36%
Spain	2.23%
Sweden	0.98%
Turkey	2.59%
United Kingdom	6.31%
United States	5.38%
Total	64.26%

Notes:
Export share is the amount of exports shipped to a particular destination as a share of total exports in the industry. Export data to a particular destination at the industry level are taken by OECD STAN data base.

Appendix 3: Summary Statistics

Variable	N	Mean	Std. Dev.	Min	Max
X	324	158570524	1.32	2444839	2034996630
p	324	69.05	0.53	18.31	155.97
Y	324	159511	0.34	47966	340204
μ	324	1.38	0.47	0.81	5.08
DMP	324	877.81	1.44	5.85	10074.73
TC	322	17348038	1.55	36103	600612184

Appendix 4: Pavitt Taxonomy

Low Technology Groups		High Technology Groups	
SDOM	SCAI	SCIB	SPEC
Food, Beverages and Tobacco (15t16)	Wood and Cork (20)	Chemicals and Chemical (24)	Machinery (29)
Textiles, Leather and Footwear (17t19)	Rubber and plastics (25)	Office and Computing Machinery (32)	Electrical machinery (31)
Pulp, Paper , Printing and Publishing (21t22)	Other Non-Metallic (26)	Radio, television and communication equipment (33)	Motor Vehicles, Trailers and Semi-Trailers (34)
	Basic metals (27)	Medical, precision and optical instruments (30)	Other transport equipment (35)
	Fabricated metal (28)		Recycling and other Manufacturing (36t37)